

# Thyristor Modules

## Thyristor/Diode Modules

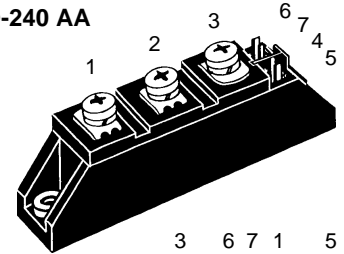
$$I_{TRMS} = 2 \times 100 \text{ A}$$

$$I_{TAVM} = 2 \times 64 \text{ A}$$

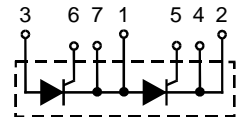
$$V_{RRM} = 800-1800 \text{ V}$$

$V_{RSM}$ $V_{DSM}$	$V_{RRM}$ $V_{DRM}$	Type			
V	V	Version 1		Version 8	
900	800	MCC 56-08io1 B	MCD 56-08io1 B	MCC 56-08io8 B	MCD 56-08io8 B
1300	1200	MCC 56-12io1 B	MCD 56-12io1 B	MCC 56-12io8 B	MCD 56-12io8 B
1500	1400	MCC 56-14io1 B	--	MCC 56-14io8 B	MCD 56-14io8 B
1700	1600	MCC 56-16io1 B	MCD 56-16io1 B	MCC 56-16io8 B	MCD 56-16io8 B
1900	1800	MCC 56-18io1 B	--	MCC 56-18io8 B	MCD 56-18io8 B
1500	1400	MCC 56-14io1			
1700	1600	MCC 56-16io1			
700	600	MDC 56-06io1 B			

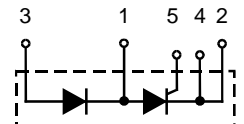
TO-240 AA



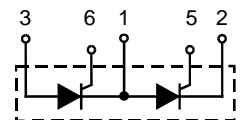
MCC  
Version 1



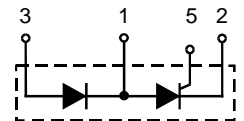
MCD  
Version 1



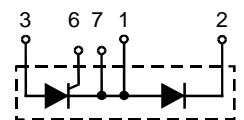
MCC  
Version 8



MCD  
Version 8



MDC  
Version 1



### Features

- International standard package, JEDEC TO-240 AA
- Direct copper bonded  $Al_2O_3$  -ceramic base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered, E 72873
- Gate-cathode twin pins for version 1B

### Applications

- DC motor control
- Softstart AC motor controller
- Light, heat and temperature control

### Advantages

- Space and weight savings
- Simple mounting with two screws
- Improved temperature and power cycling
- Reduced protection circuits

Symbol	Test Conditions		Maximum Ratings	
$I_{TRMS}$ , $I_{FRMS}$ $I_{TAVM}$ , $I_{FAVM}$	$T_{VJ} = T_{VJM}$ $T_C = 83^\circ C$ ; 180° sine $T_C = 85^\circ C$ ; 180° sine		100 64 60	A A A
$I_{TSM}$ , $I_{FSM}$	$T_{VJ} = 45^\circ C$ ; $V_R = 0$	$t = 10 \text{ ms}$ (50 Hz), sine $t = 8.3 \text{ ms}$ (60 Hz), sine	1500 1600	A A
	$T_{VJ} = T_{VJM}$ $V_R = 0$	$t = 10 \text{ ms}$ (50 Hz), sine $t = 8.3 \text{ ms}$ (60 Hz), sine	1350 1450	A A
$\int i^2 dt$	$T_{VJ} = 45^\circ C$ $V_R = 0$	$t = 10 \text{ ms}$ (50 Hz), sine $t = 8.3 \text{ ms}$ (60 Hz), sine	11 200 10 750	A <sup>2</sup> s A <sup>2</sup> s
	$T_{VJ} = T_{VJM}$ $V_R = 0$	$t = 10 \text{ ms}$ (50 Hz), sine $t = 8.3 \text{ ms}$ (60 Hz), sine	9100 8830	A <sup>2</sup> s A <sup>2</sup> s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$ $f = 50 \text{ Hz}$ , $t_p = 200 \mu s$ $V_D = 2/3 V_{DRM}$ $I_G = 0.45 \text{ A}$ $di_G/dt = 0.45 \text{ A}/\mu s$	repetitive, $I_T = 150 \text{ A}$  non repetitive, $I_T = I_{TAVM}$	150 500	A/ $\mu s$ A/ $\mu s$
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}$ ; $R_{GK} = \infty$ ; method 1 (linear voltage rise)	$V_{DR} = 2/3 V_{DRM}$	1000	V/ $\mu s$
$P_{GM}$	$T_{VJ} = T_{VJM}$ $I_T = I_{TAVM}$	$t_p = 30 \mu s$ $t_p = 300 \mu s$	10 5 0.5	W W W
$P_{GAV}$				
$V_{RGM}$			10	V
$T_{VJ}$			-40...+125	°C
$T_{VJM}$			125	°C
$T_{stg}$			-40...+125	°C
$V_{ISOL}$	50/60 Hz, RMS $I_{ISOL} \leq 1 \text{ mA}$	$t = 1 \text{ min}$ $t = 1 \text{ s}$	3000 3600	V~ V~
$M_d$	Mounting torque (M5) Terminal connection torque (M5)		2.5-4.0/22-35 2.5-4.0/22-35	Nm/lb.in. Nm/lb.in.
Weight	Typical including screws		90	g

Data according to IEC 60747 and refer to a single thyristor/diode unless otherwise stated.  
IXYS reserves the right to change limits, test conditions and dimensions

Symbol	Test Conditions	Characteristic Values
$I_{RRM}, I_{DRM}$	$T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$	5 mA
$V_T, V_F$	$I_T, I_F = 200 \text{ A}; T_{VJ} = 25^\circ\text{C}$	1.57 V
$V_{T0}$	For power-loss calculations only ( $T_{VJ} = 125^\circ\text{C}$ )	0.85 V
$r_T$		3.7 mΩ
$V_{GT}$	$V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$	1.5 V
	$T_{VJ} = -40^\circ\text{C}$	1.6 V
$I_{GT}$	$V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$	100 mA
	$T_{VJ} = -40^\circ\text{C}$	200 mA
$V_{GD}$	$T_{VJ} = T_{VJM}; V_D = 2/3 V_{DRM}$	0.2 V
$I_{GD}$		10 mA
$I_L$	$T_{VJ} = 25^\circ\text{C}; t_p = 10 \mu\text{s}; V_D = 6 \text{ V}$ $I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$	450 mA
$I_H$	$T_{VJ} = 25^\circ\text{C}; V_D = 6 \text{ V}; R_{GK} = \infty$	200 mA
$t_{gd}$	$T_{VJ} = 25^\circ\text{C}; V_D = 1/2 V_{DRM}$ $I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$	2 μs
$t_q$	$T_{VJ} = T_{VJM}; I_T = 150 \text{ A}, t_p = 200 \mu\text{s}; -di/dt = 10 \text{ A}/\mu\text{s}$ typ. $V_R = 100 \text{ V}; dv/dt = 20 \text{ V}/\mu\text{s}; V_D = 2/3 V_{DRM}$	150 μs
$Q_S$	$T_{VJ} = T_{VJM}; I_T, I_F = 50 \text{ A}, -di/dt = 3 \text{ A}/\mu\text{s}$	100 μC
$I_{RM}$		24 A
$R_{thJC}$	per thyristor/diode; DC current per module	0.45 K/W
$R_{thJK}$	per thyristor/diode; DC current per module	0.225 K/W
	other values see Fig. 8/9	0.65 K/W
		0.325 K/W
$d_s$	Creepage distance on surface	12.7 mm
$d_A$	Strike distance through air	9.6 mm
$a$	Maximum allowable acceleration	50 m/s <sup>2</sup>

Optional accessories for module-type MCC 56 version 1 B

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = yellow, cathode = red

Type ZY 200L (L = Left for pin pair 4/5) } UL 758, style 1385,

Type ZY 200R (R = right for pin pair 6/7) } CSA class 5851, guide 460-1-1

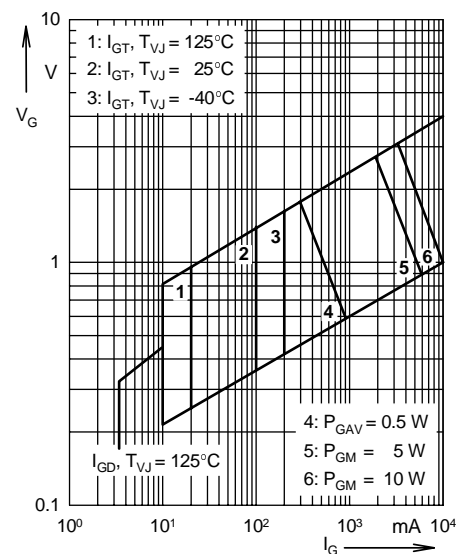


Fig. 1 Gate trigger characteristics

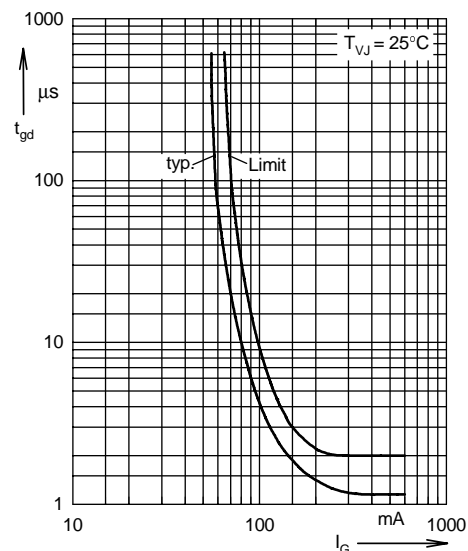
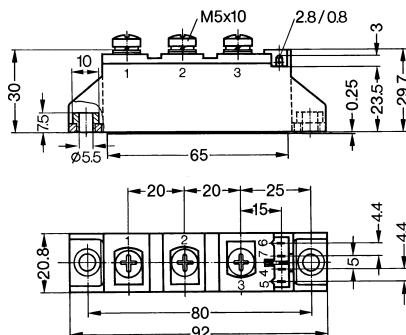


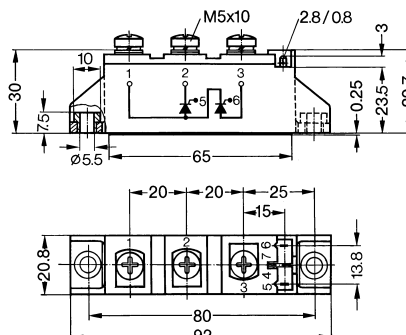
Fig. 2 Gate trigger delay time

Dimensions in mm (1 mm = 0.0394")

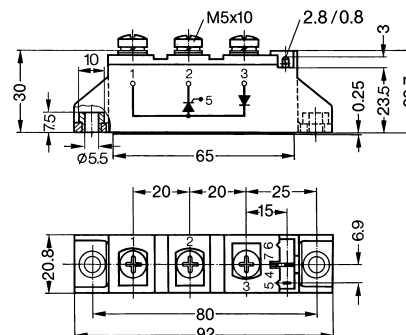
MCC / MCD / MDC Version 1 B



MCC Version 8 B



MCD Version 8 B



Version 1 or 8 without B in typ designation = without insert in mountig holes

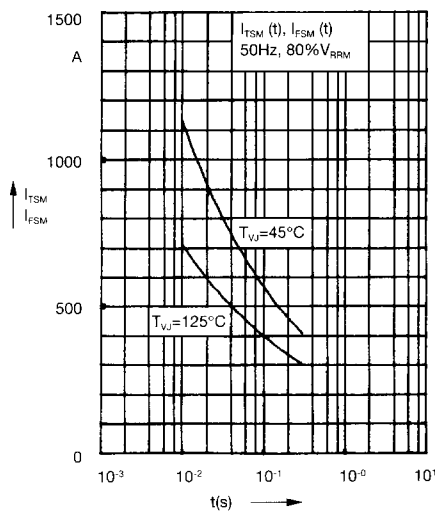


Fig. 3 Surge overload current  
 $I_{TSM}, I_{FSM}$ : Crest value,  $t$ : duration

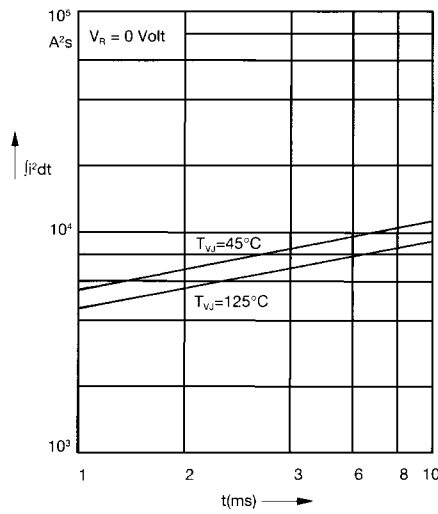


Fig. 4  $\int i^2 dt$  versus time (1-10 ms)

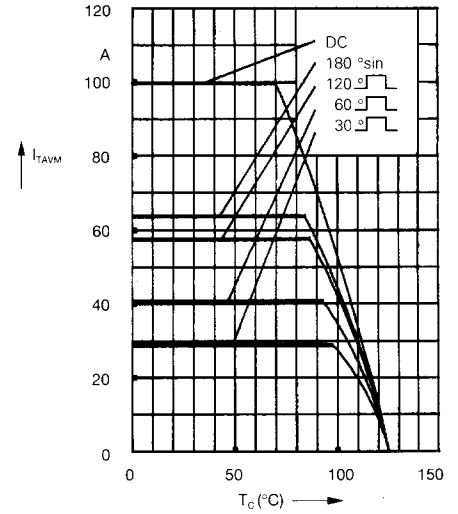


Fig. 4a Maximum forward current at case temperature

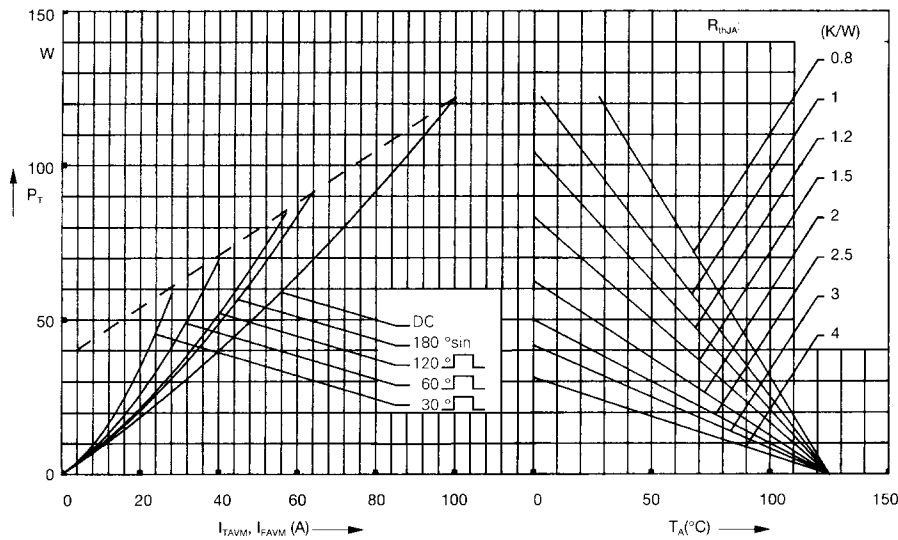


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

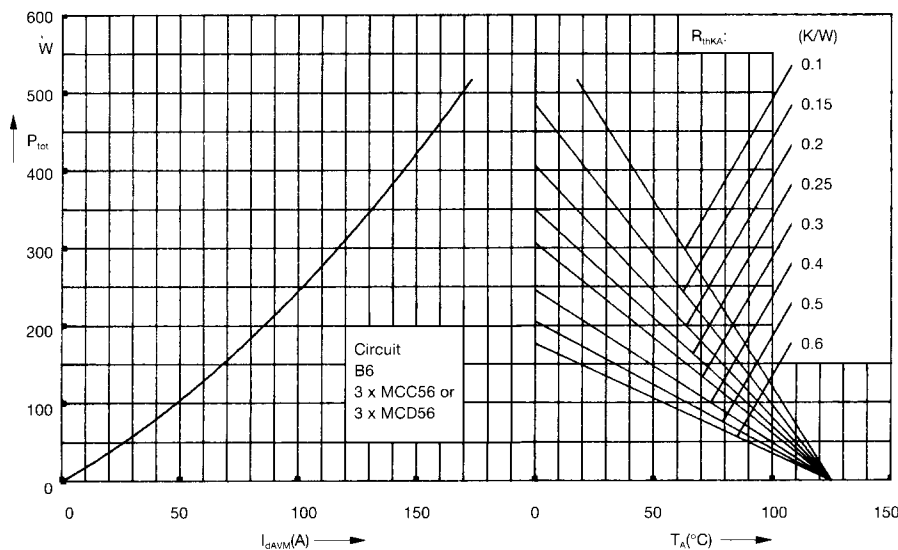


Fig. 6 Three phase rectifier bridge:  
Power dissipation versus direct output current and ambient temperature

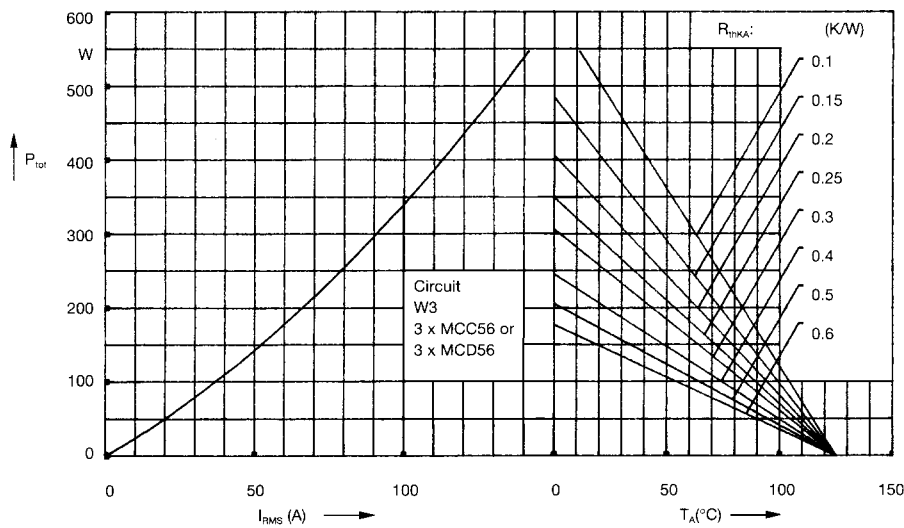


Fig. 7 Three phase AC-controller:  
Power dissipation versus RMS  
output current and ambient  
temperature

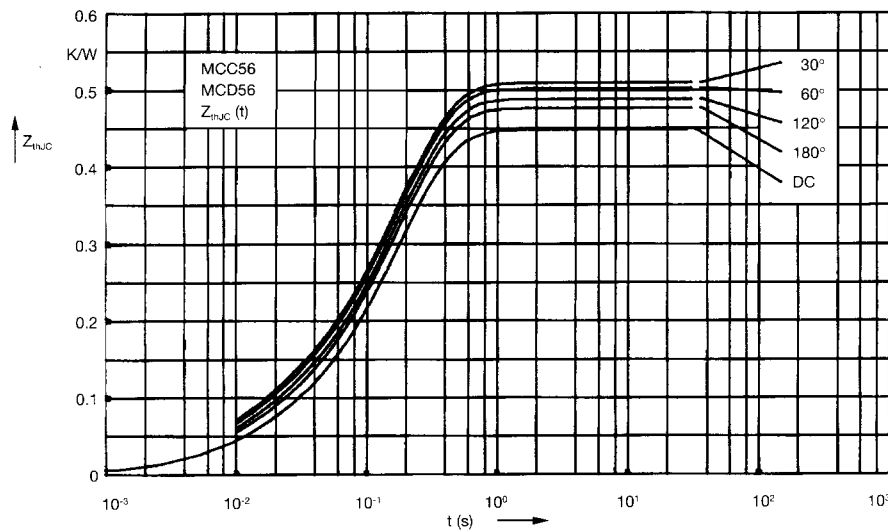


Fig. 8 Transient thermal impedance  
junction to case (per thyristor or  
diode)

$R_{thJC}$  for various conduction angles  $d$ :

$d$	$R_{thJC}$ (K/W)
DC	0.45
180°	0.47
120°	0.49
60°	0.505
30°	0.52

Constants for  $Z_{thJC}$  calculation:

$i$	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.014	0.015
2	0.026	0.0095
3	0.41	0.175

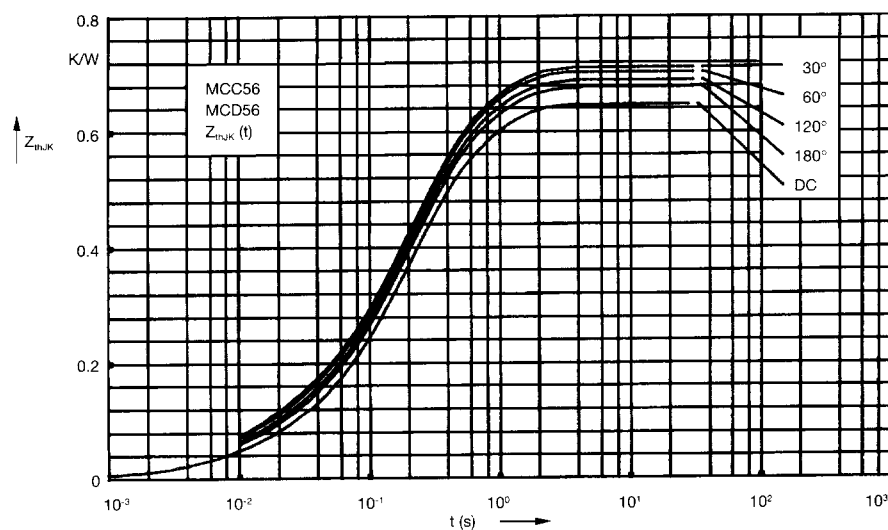


Fig. 9 Transient thermal impedance  
junction to heatsink (per thyristor  
or diode)

$R_{thJK}$  for various conduction angles  $d$ :

$d$	$R_{thJK}$ (K/W)
DC	0.65
180°	0.67
120°	0.69
60°	0.705
30°	0.72

Constants for  $Z_{thJK}$  calculation:

$i$	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.014	0.015
2	0.026	0.0095
3	0.41	0.175
4	0.2	0.67